Wheat Watchers

Weighing the utility of Sentinel-2 to better monitor the crop in Kansas

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USDA / National Agricultural Statistics Service

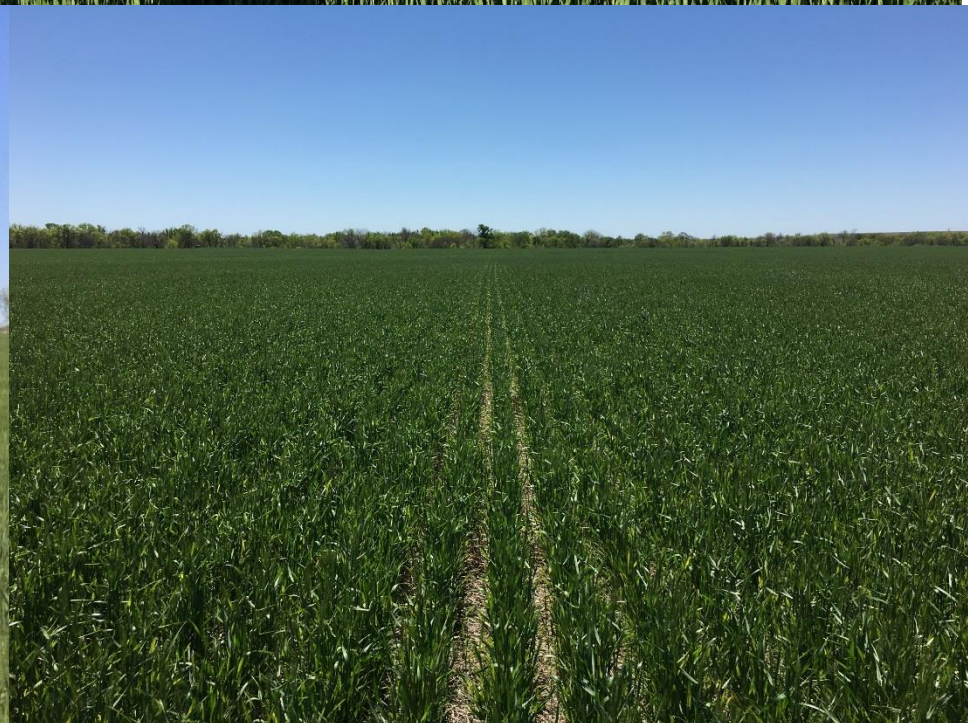
2016 Summer Landsat Science Team Meeting

SDSU, Brookings, July 27th

Maryland

Free State

Kansas

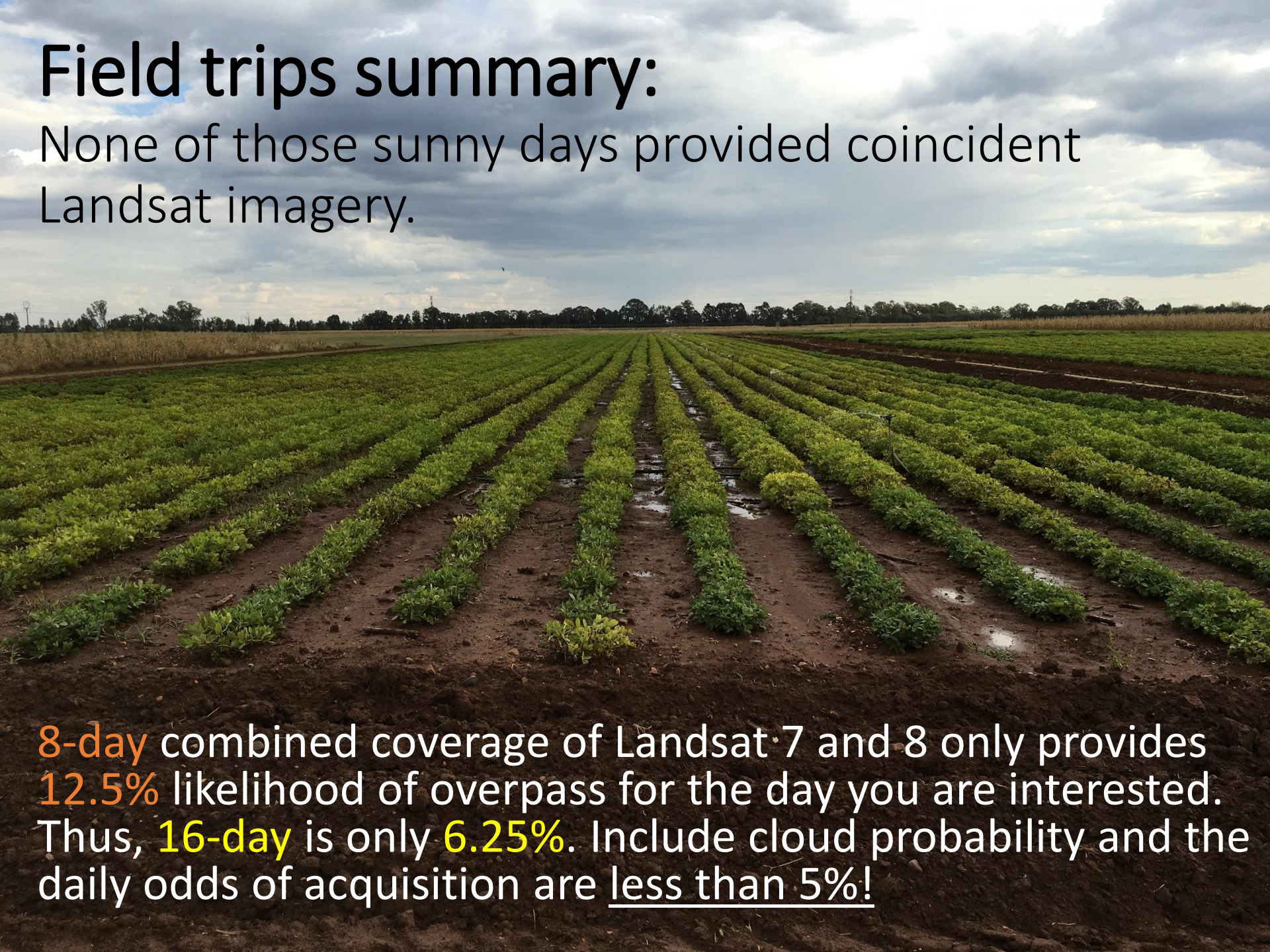


Iowa

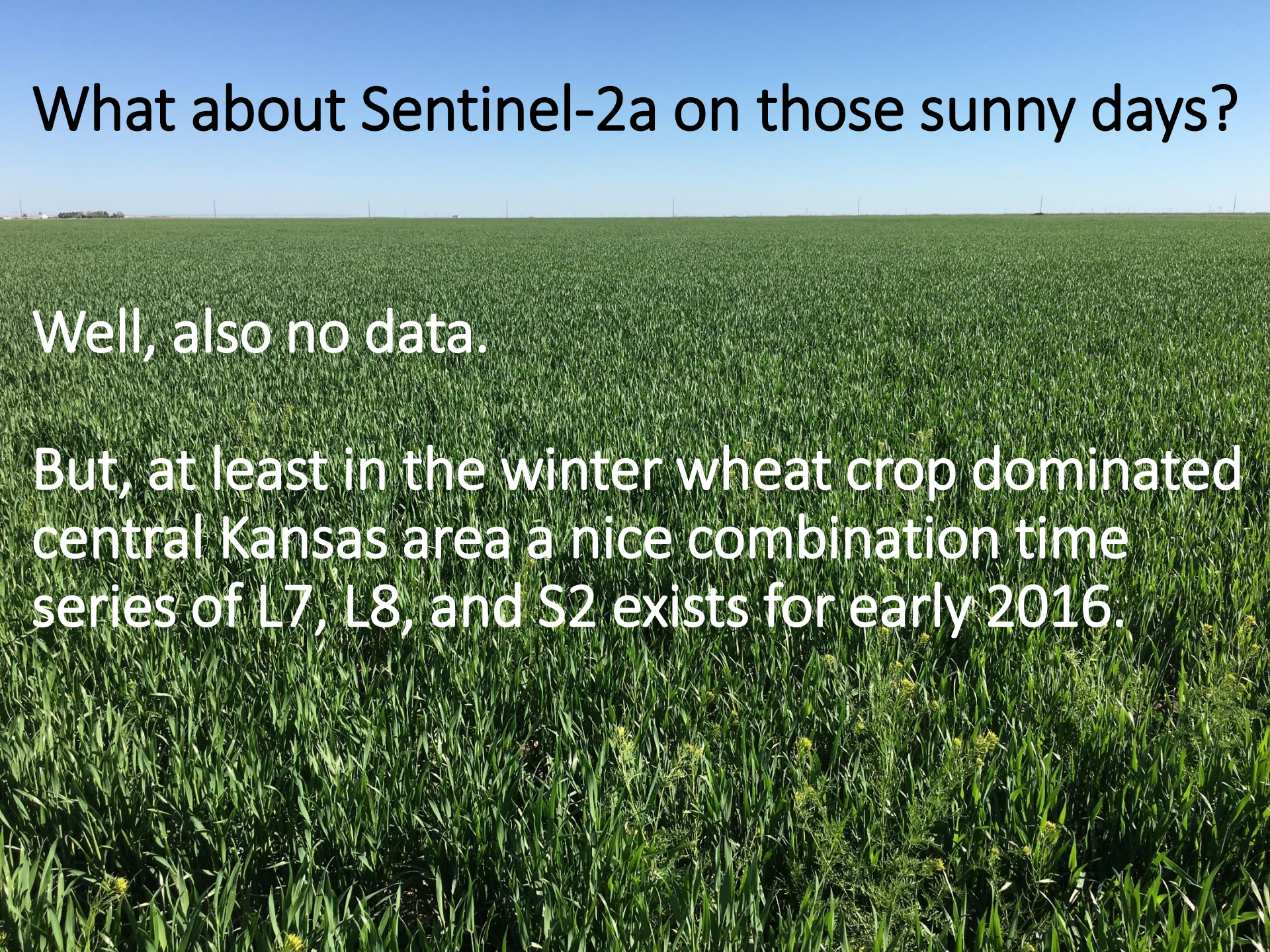
South Dakota

Field trips summary:

None of those sunny days provided coincident Landsat imagery.



8-day combined coverage of Landsat 7 and 8 only provides 12.5% likelihood of overpass for the day you are interested. Thus, 16-day is only 6.25%. Include cloud probability and the daily odds of acquisition are less than 5%!

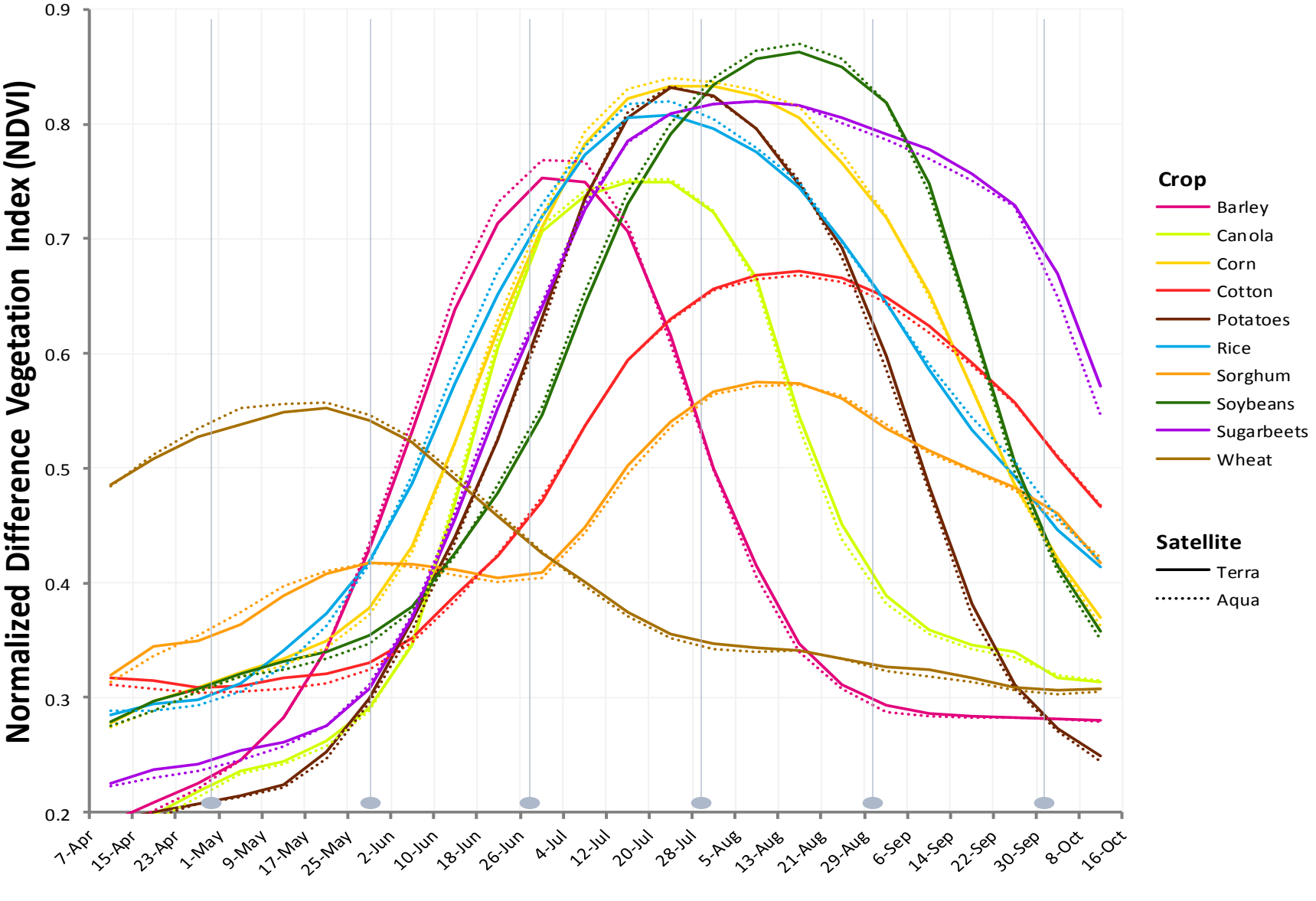


What about Sentinel-2a on those sunny days?

Well, also no data.

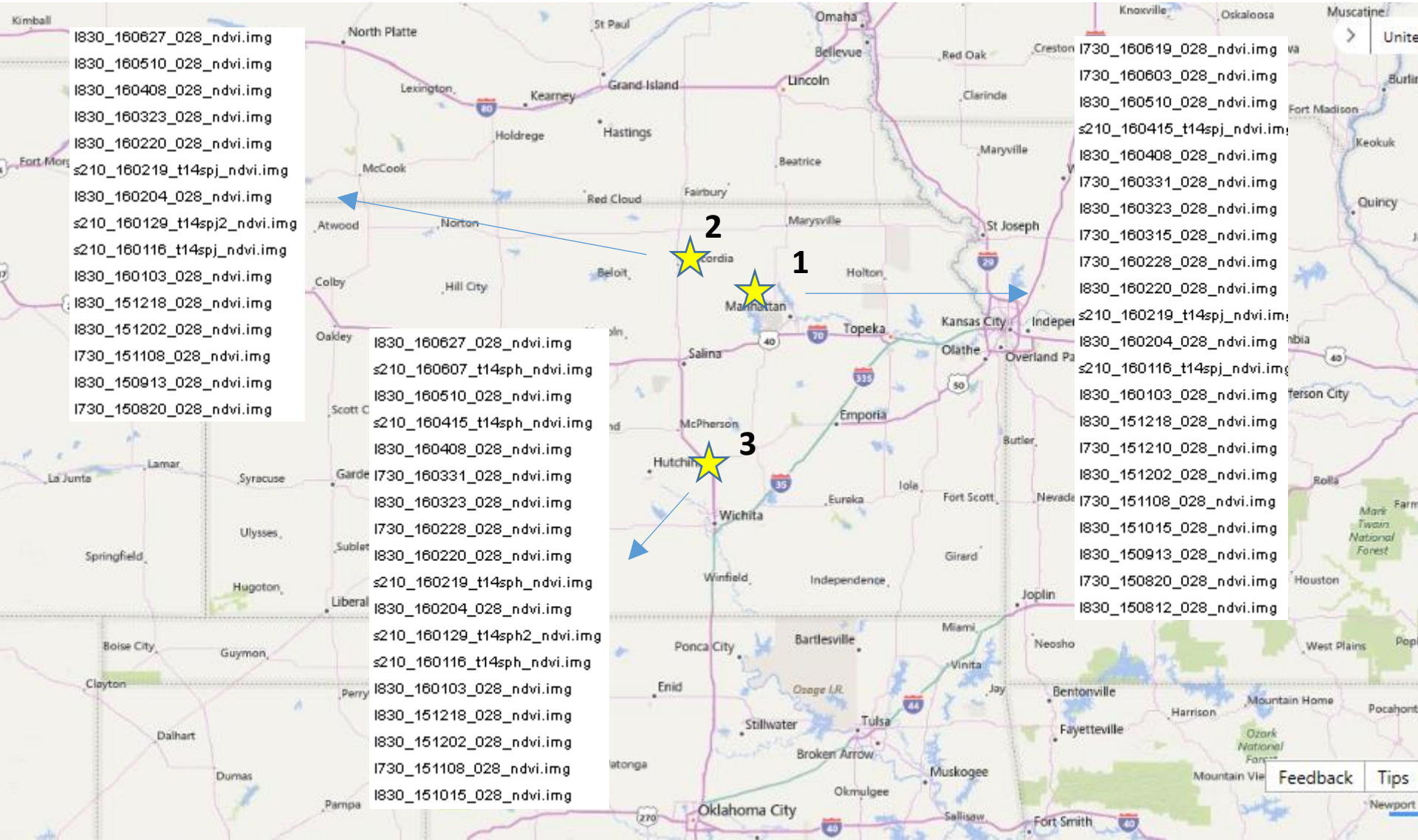
But, at least in the winter wheat crop dominated central Kansas area a nice combination time series of L7, L8, and S2 exists for early 2016.

Typical NDVI crop phenology over US from MODIS



USDA crop production reporting dates

Three visited winter wheat fields had reasonably cloud free Landsat time series from late 2015 through 2016 in conjunction with some Sentinel-2a scenes too.

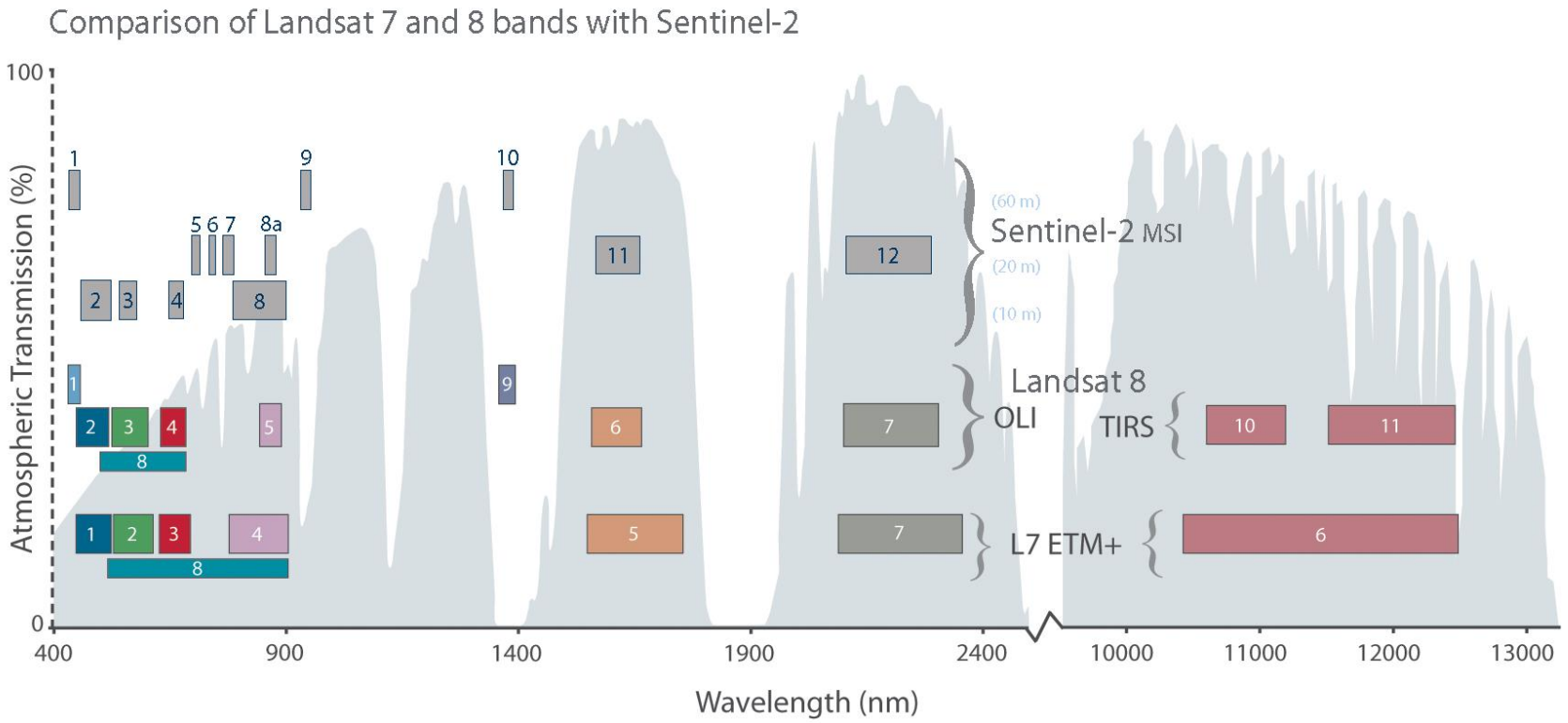


With Sentinel-2, file and path names are long…

- S2A_OPER_MSI_L1C_TL_MPS__20160607T173825_20160607T222007_A005014_T14SNH_N02_02_01.zip
- I:\S2\S2A_OPER_PRD_MSIL1C_PDMC_20160608T055243_R012_V20160607T172910_20160607T172910.SAFE\GRANULE\S2A_OPER_MSI_L1C_TL_MPS__20160607T222007_A005014_T14SNH_N02.02\IMG_DATA\S2A_OPER_MSI_L1C_TL_MPS__20160607T222007_A005014_T14SNH_B01.jp2

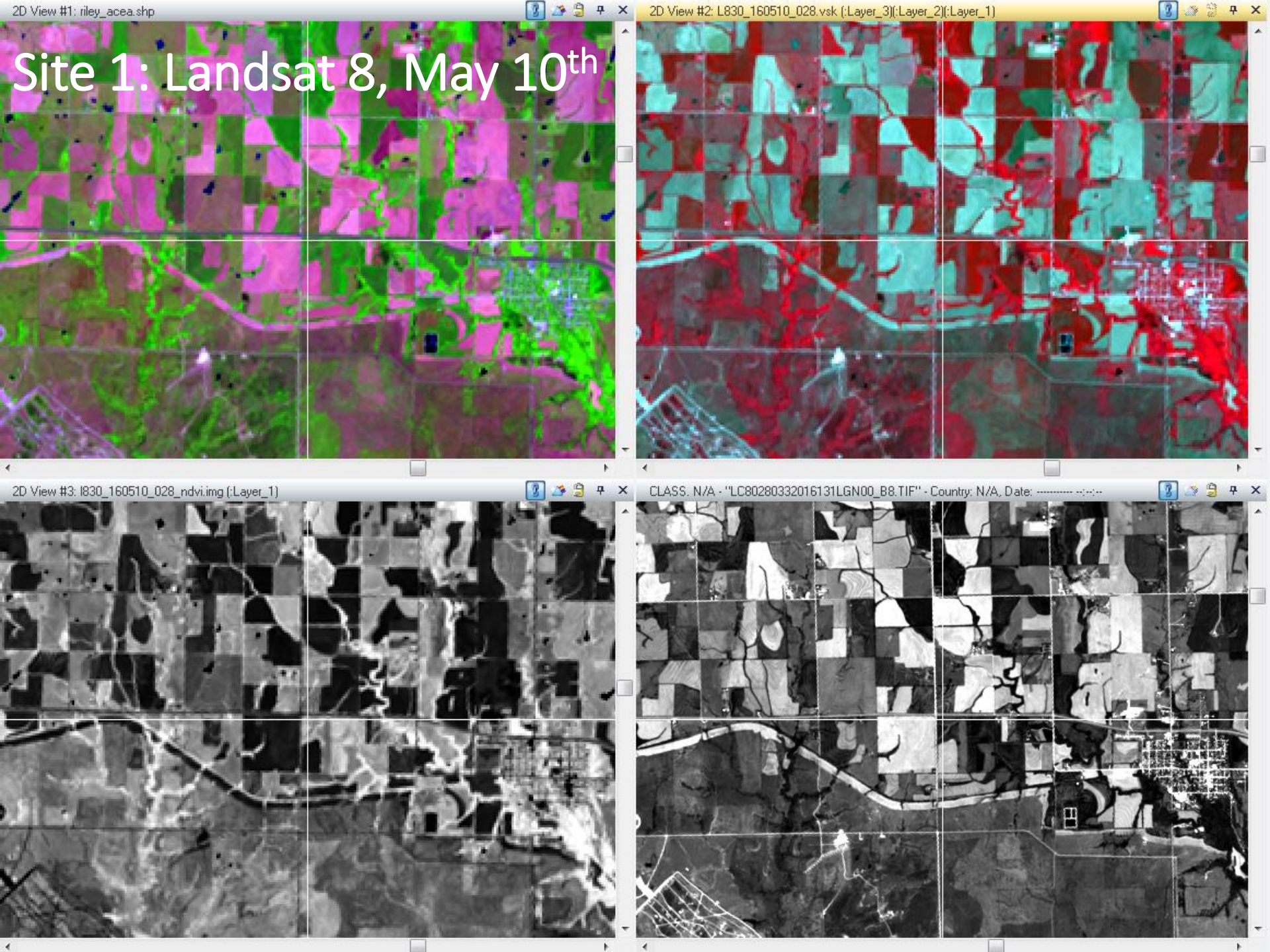
…there is a learning curve to the geographical tiling/reference system and….

…you have to constantly remind yourself what spectral bands are what.



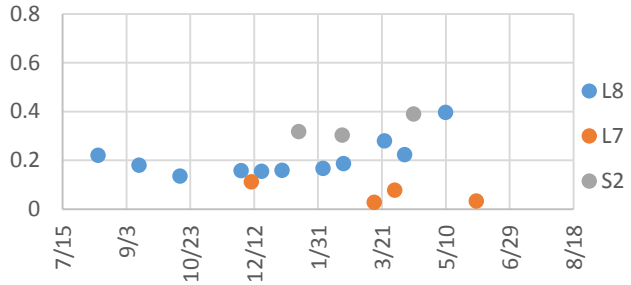
Site 1: May 3rd, 9:20AM

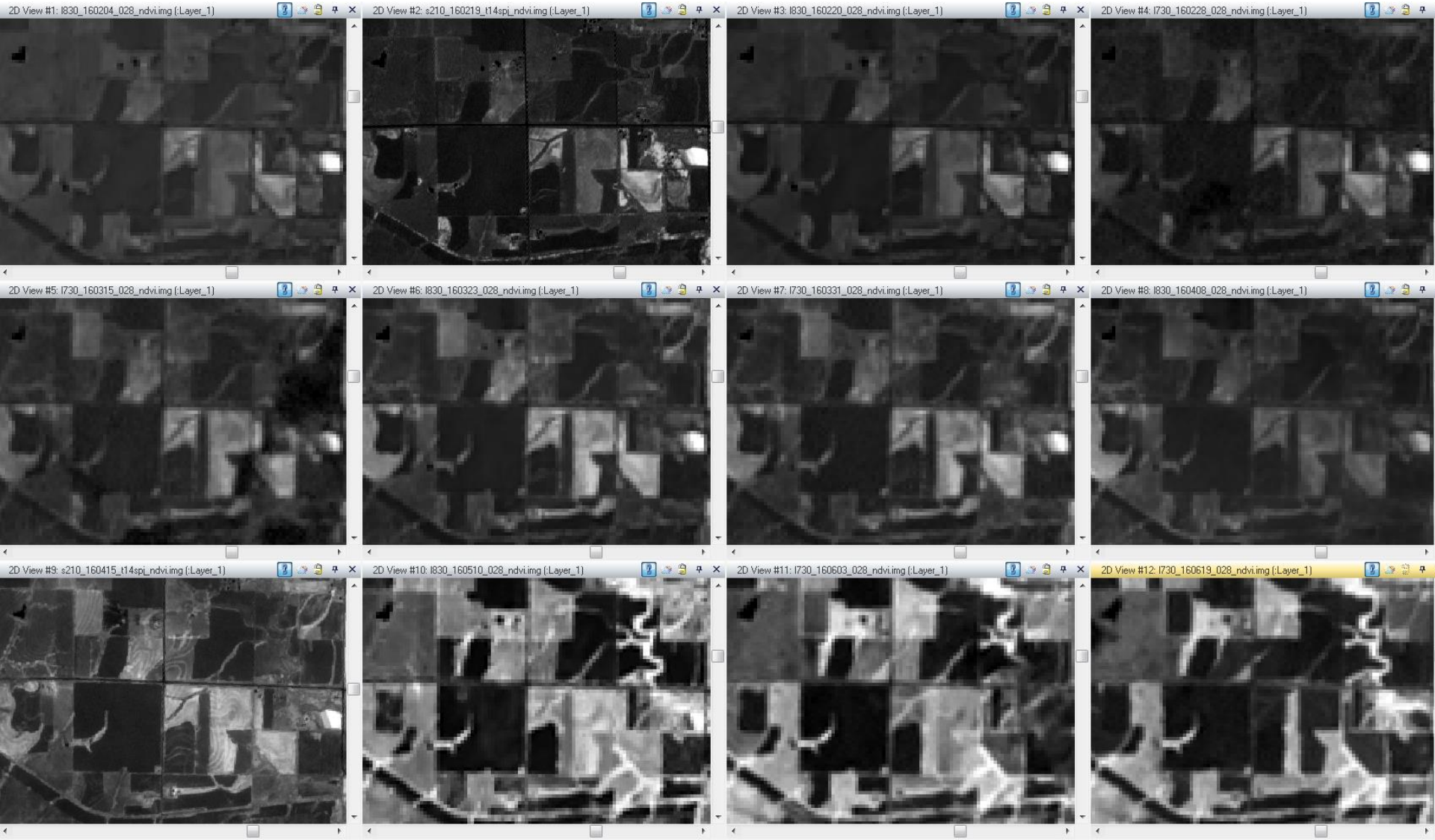
estimated 39 bushels/acre yield


2D View #1: riley_acea.shp
Site 1: Landsat 8, May 10th
2D View #2: L830_160510_028.vsk (:Layer_3)(:Layer_2)(:Layer_1)
2D View #3: l830_160510_028_ndvi.img (:Layer_1)
CLASS. N/A - "LC80280332016131LGN00_B8.TIF" - Country: N/A, Date: ---------- --:--:--

Site 1: Time Series NDVI

pictured 2/4 – 6/19

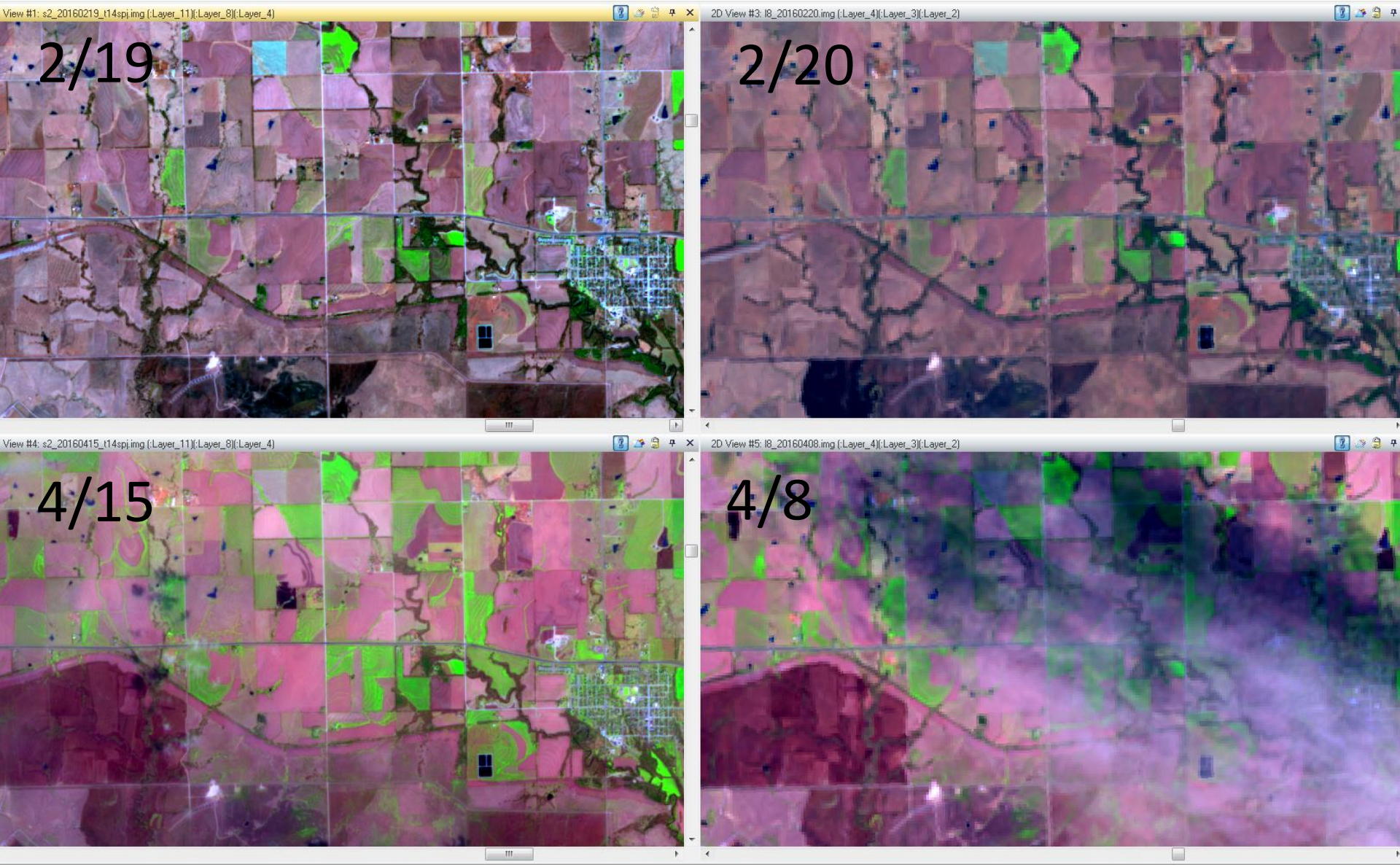




Site 1: Near-coincident comparison

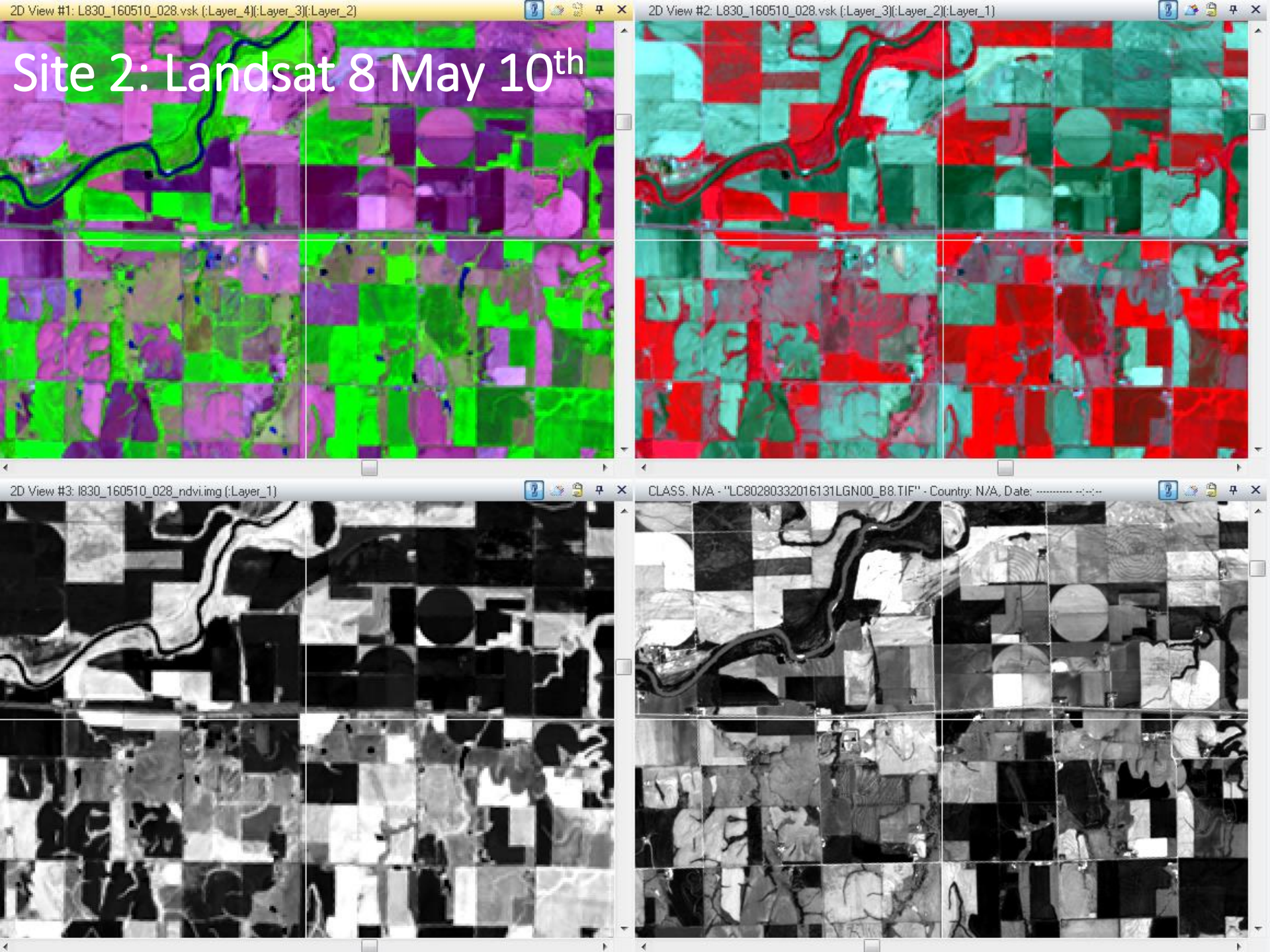
Sentinel-2a

Landsat 8



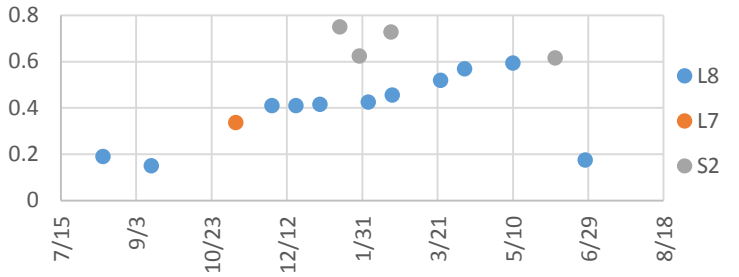
Site 2: May 3rd, 11:24AM

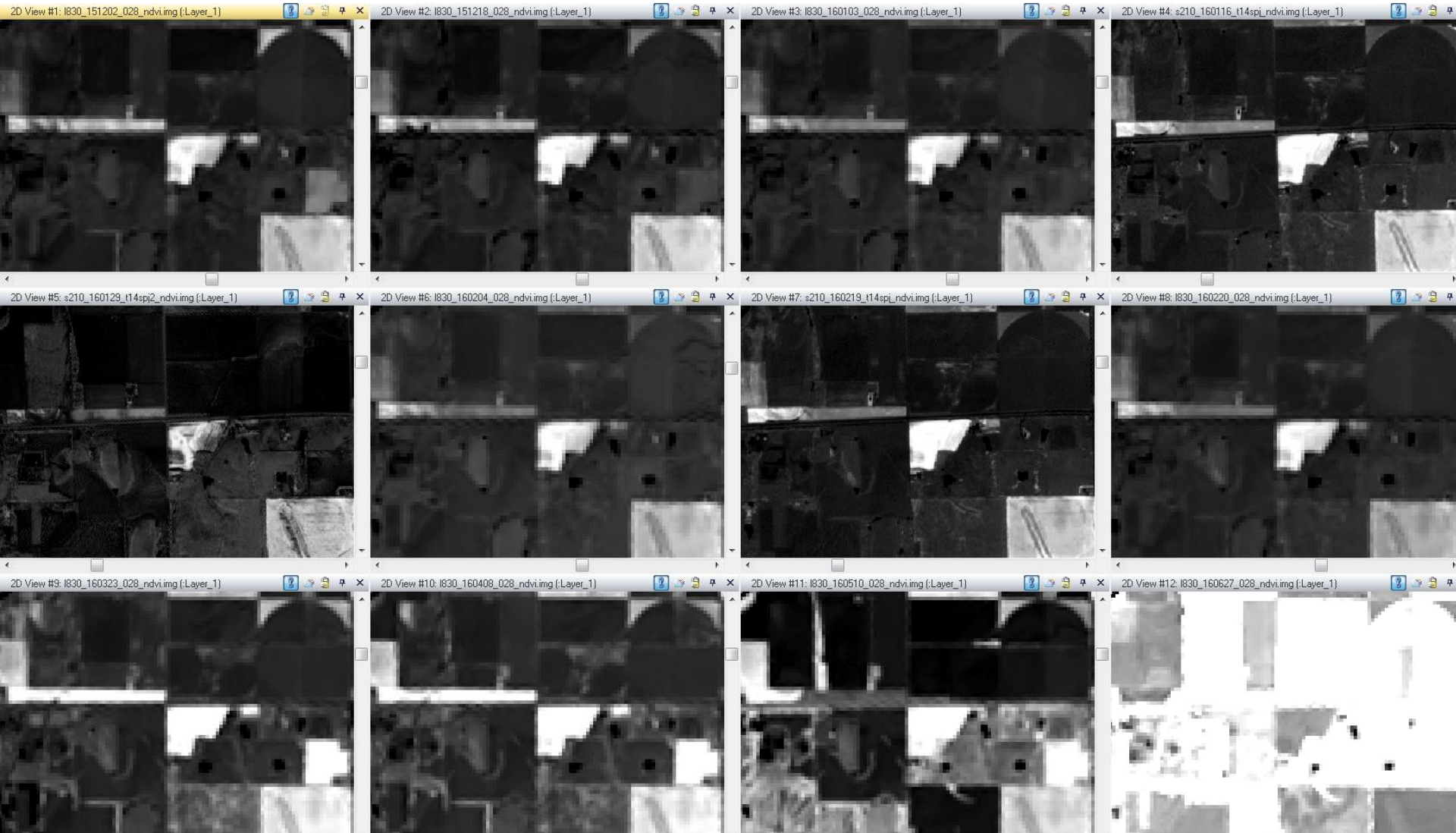
estimated 46 bushels/acre yield


2D View #1: L830_160510_028.vsk (:Layer_4)(:Layer_3)(:Layer_2)
Site 2: Landsat 8 May 10th
2D View #2: L830_160510_028.vsk (:Layer_3)(:Layer_2)(:Layer_1)
2D View #3: l830_160510_028_ndvi.img (:Layer_1)
CLASS. N/A - "LC80280332016131LGN00_B8.TIF" - Country: N/A, Date: ---------- --:--:--

Site 2: Time Series NDVI

pictured 12/2 – 6/27

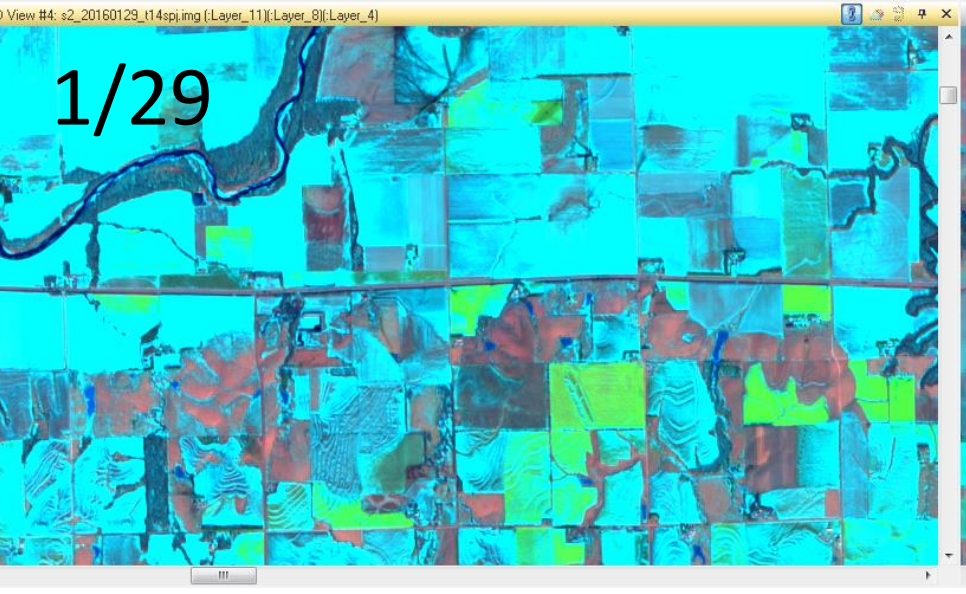


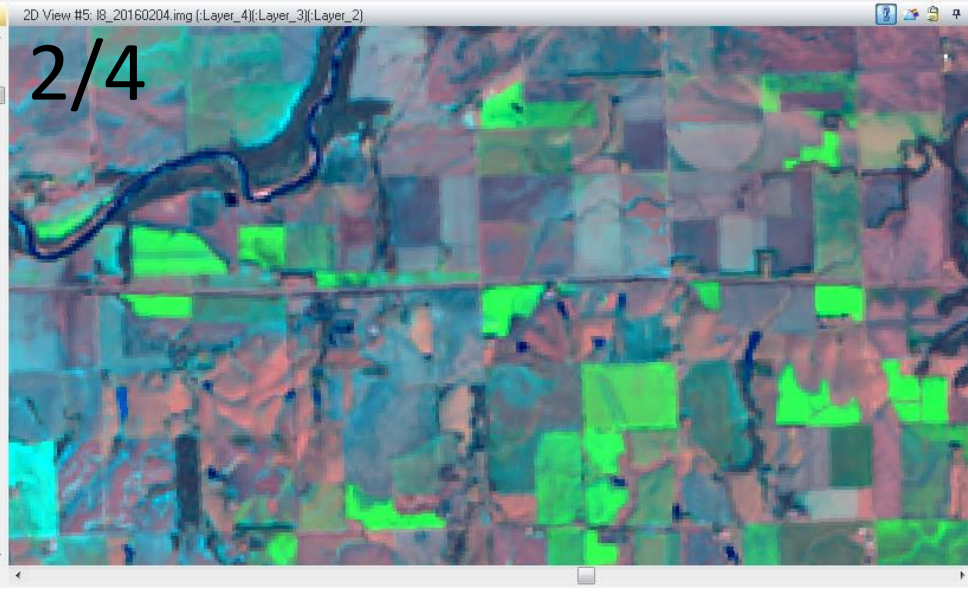


Site 2: Near-coincident comparison

Sentinel-2a

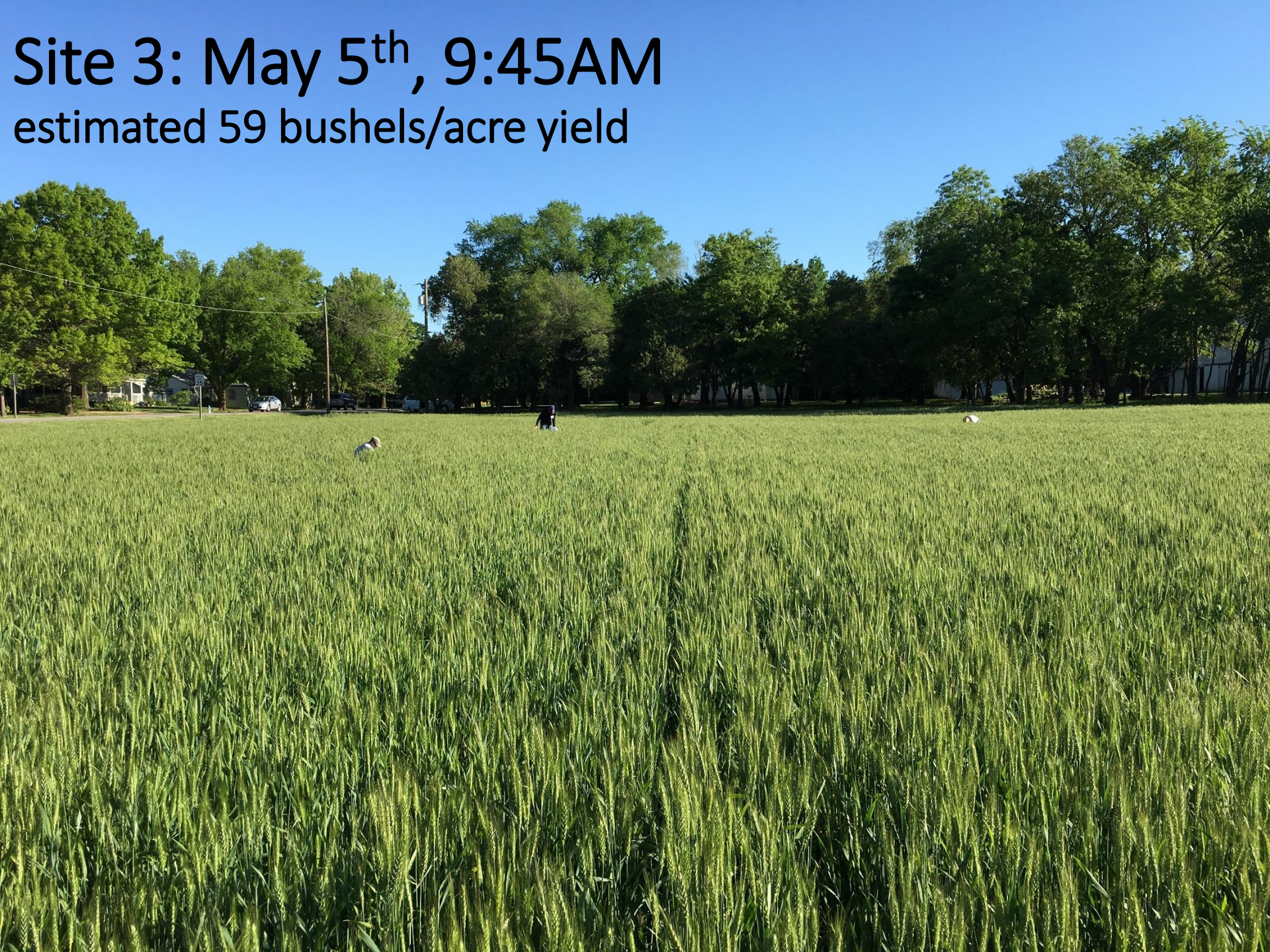
Landsat 8

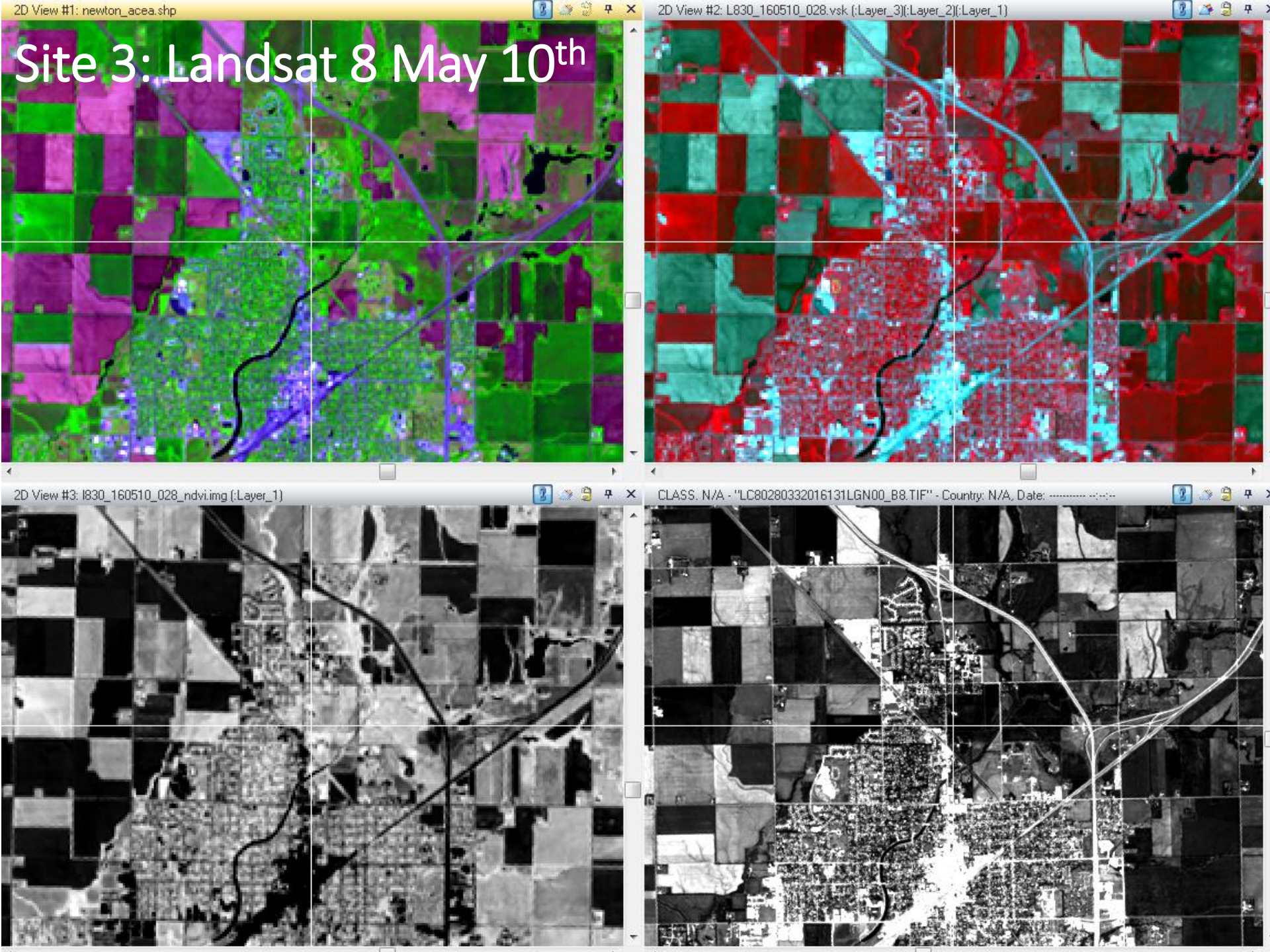




Site 3: May 5th, 9:45AM

estimated 59 bushels/acre yield




2D View #1: newton_acea.shp
Site 3: Landsat 8 May 10th
2D View #2: L830_160510_028.vsk (:Layer_3)(:Layer_2)(:Layer_1)
2D View #3: l830_160510_028_ndvi.img (:Layer_1)
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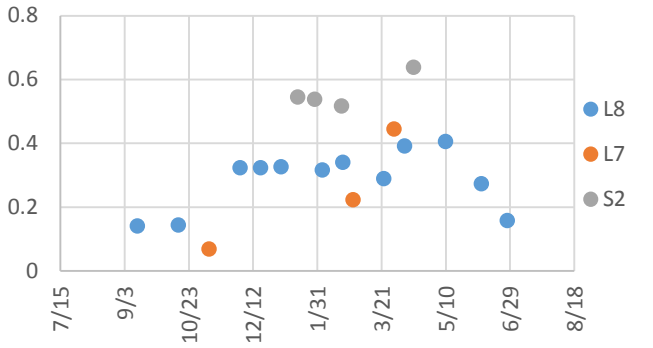
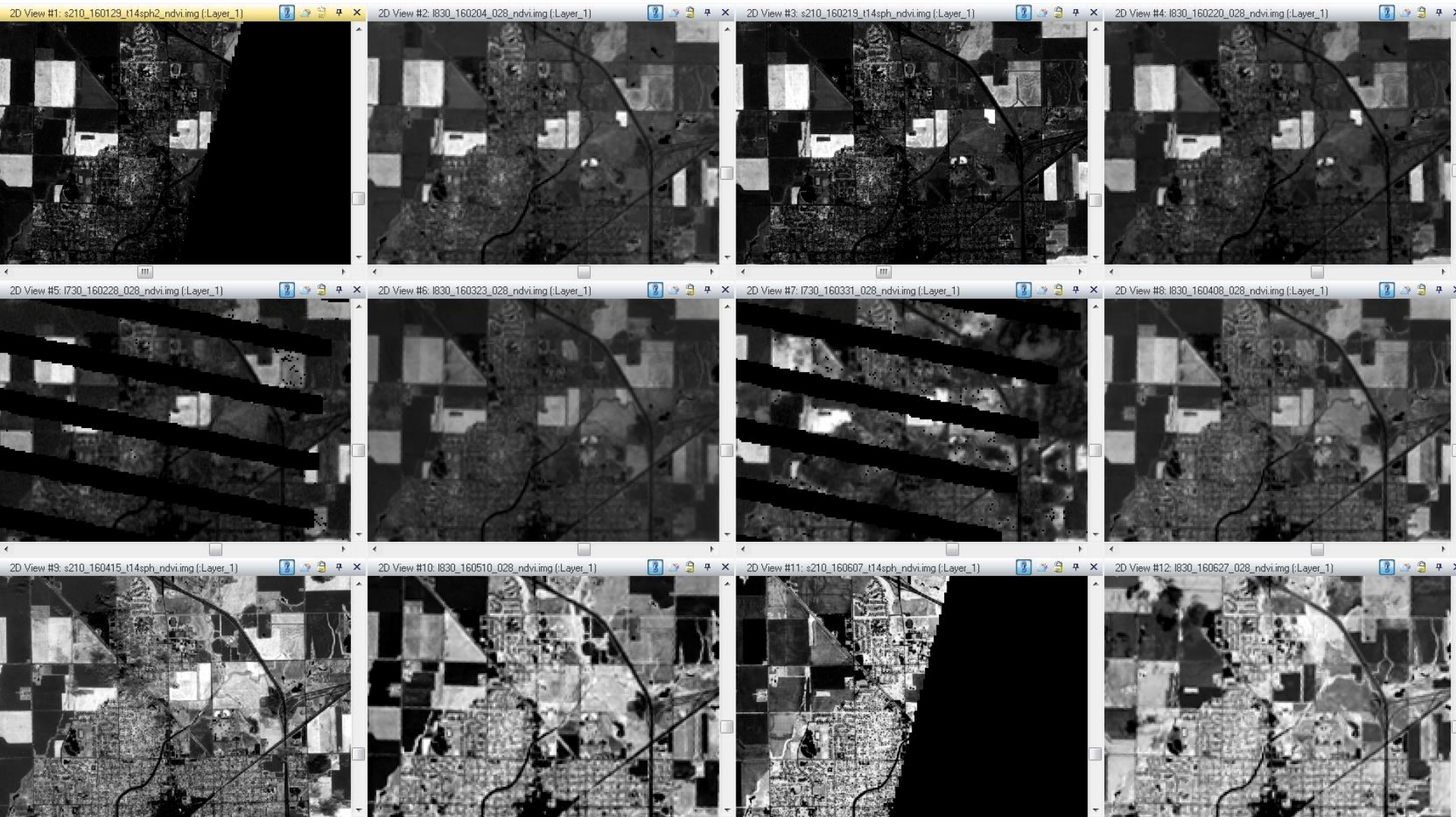
Site 3: Time Series NDVI

pictured 1/29 – 6/27

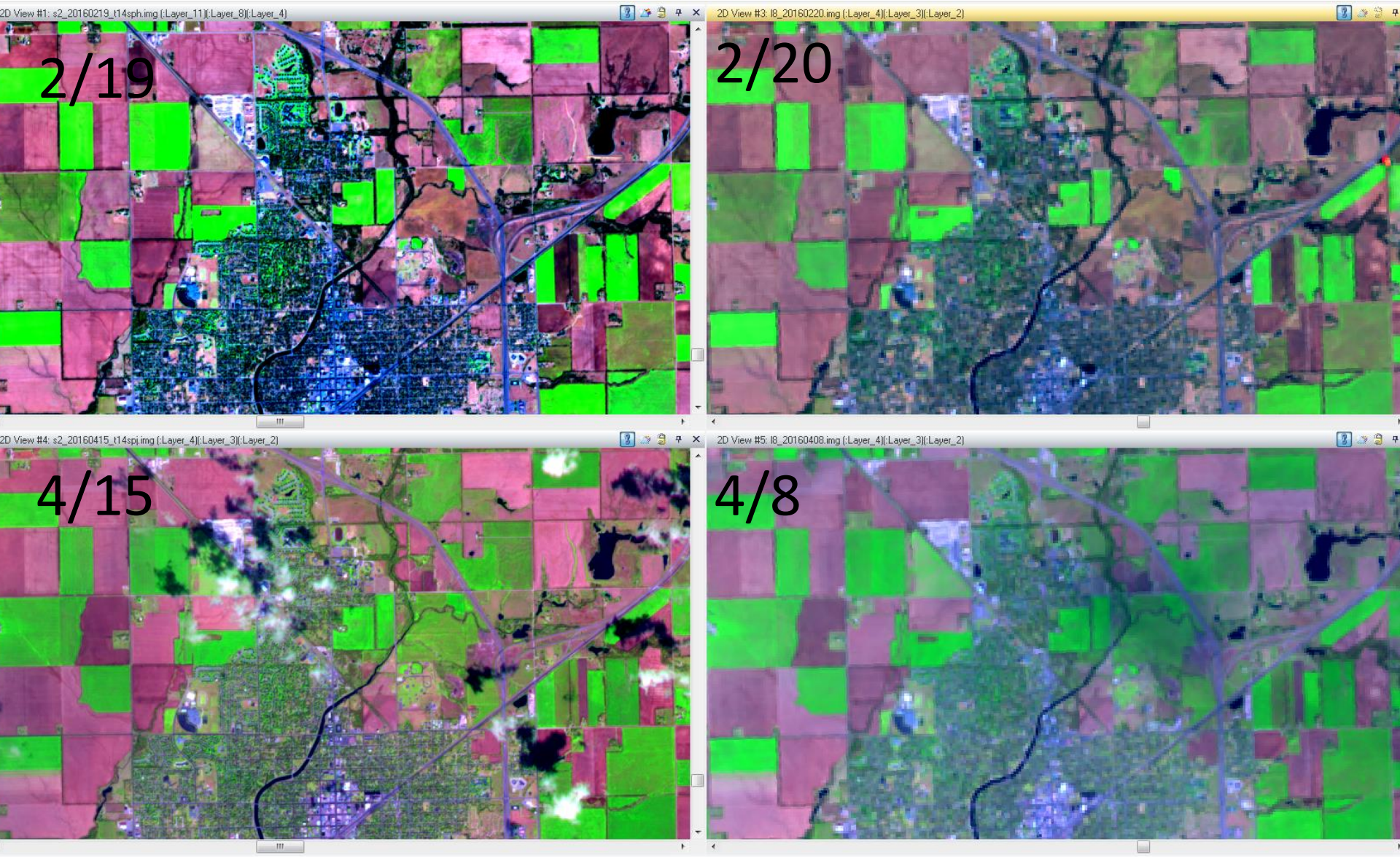




Site 3: Near-coincident comparison

Sentinel-2a

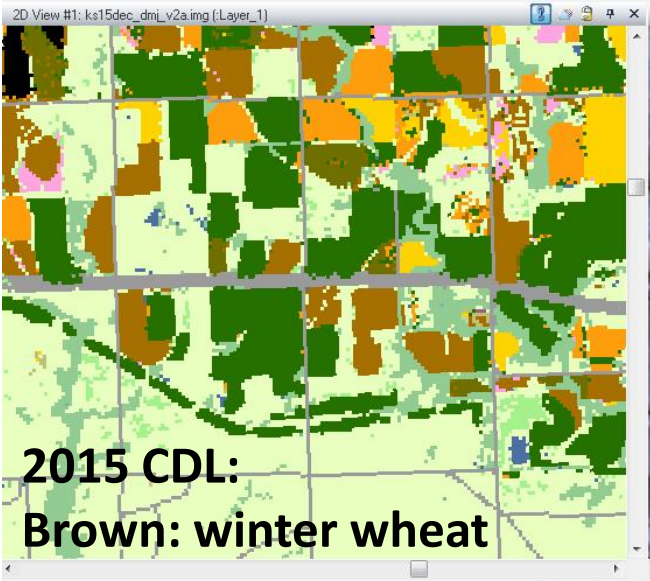
Landsat 8

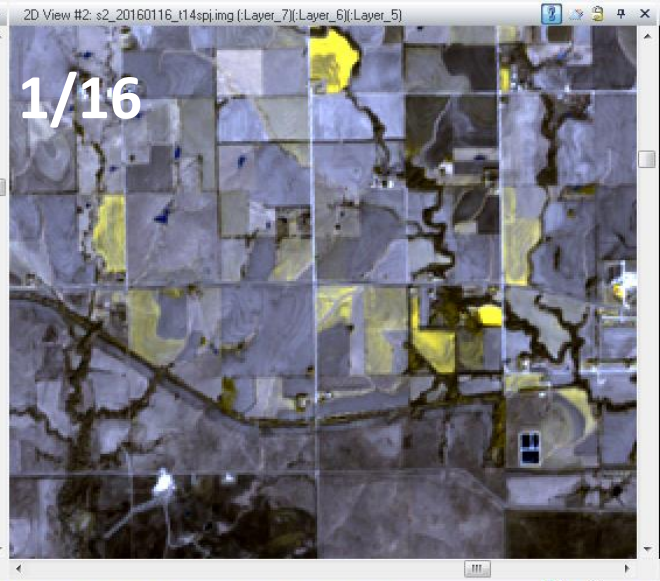


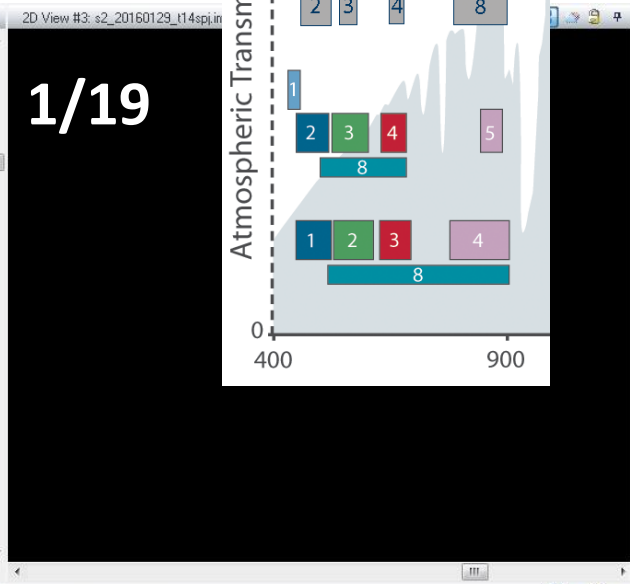
Agricultural applications will benefit from finer spatial resolution imagery

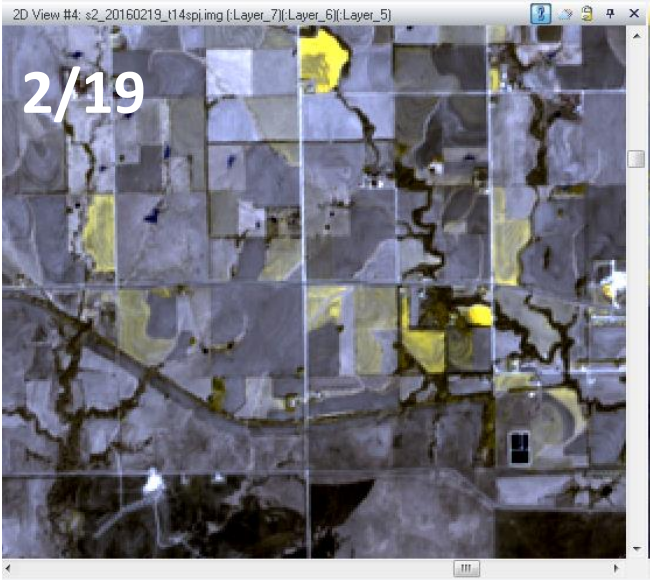
Site 1: Sentinel-2a red edge bands

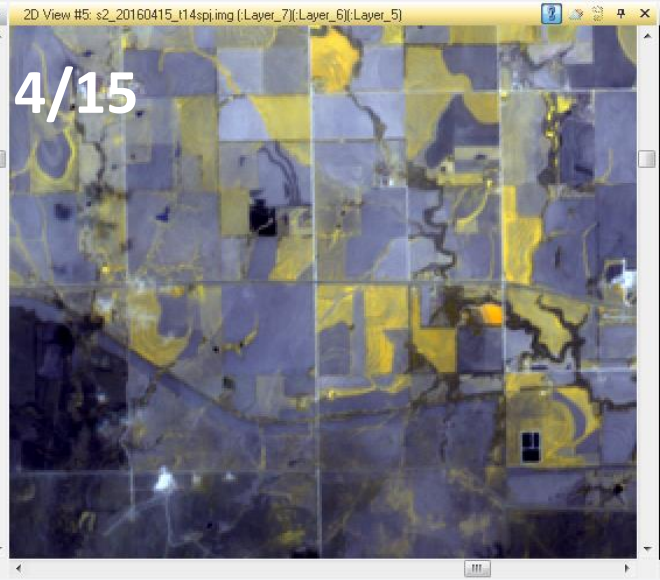
(20 m, red=b7, green=b6, blue=b5)





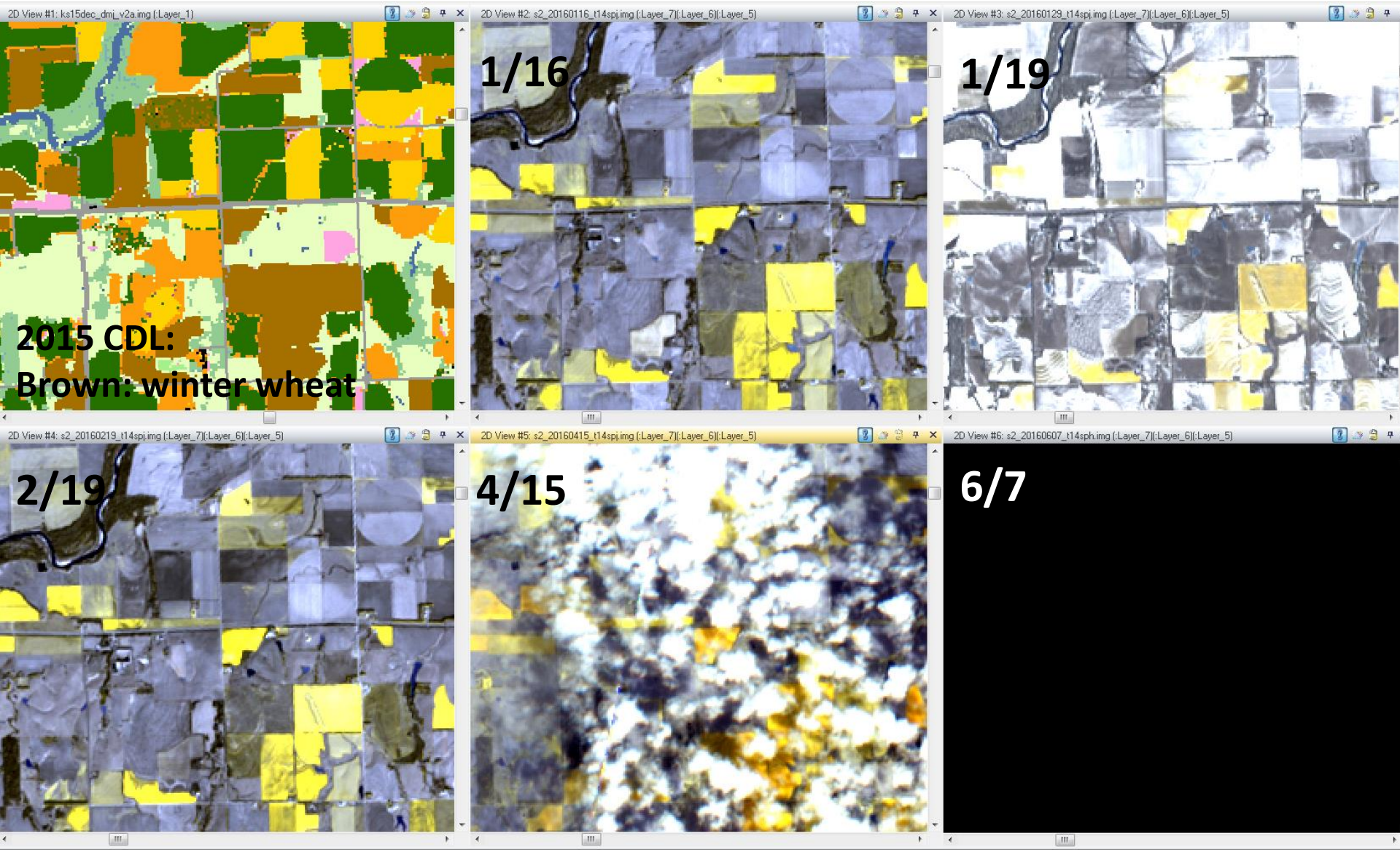






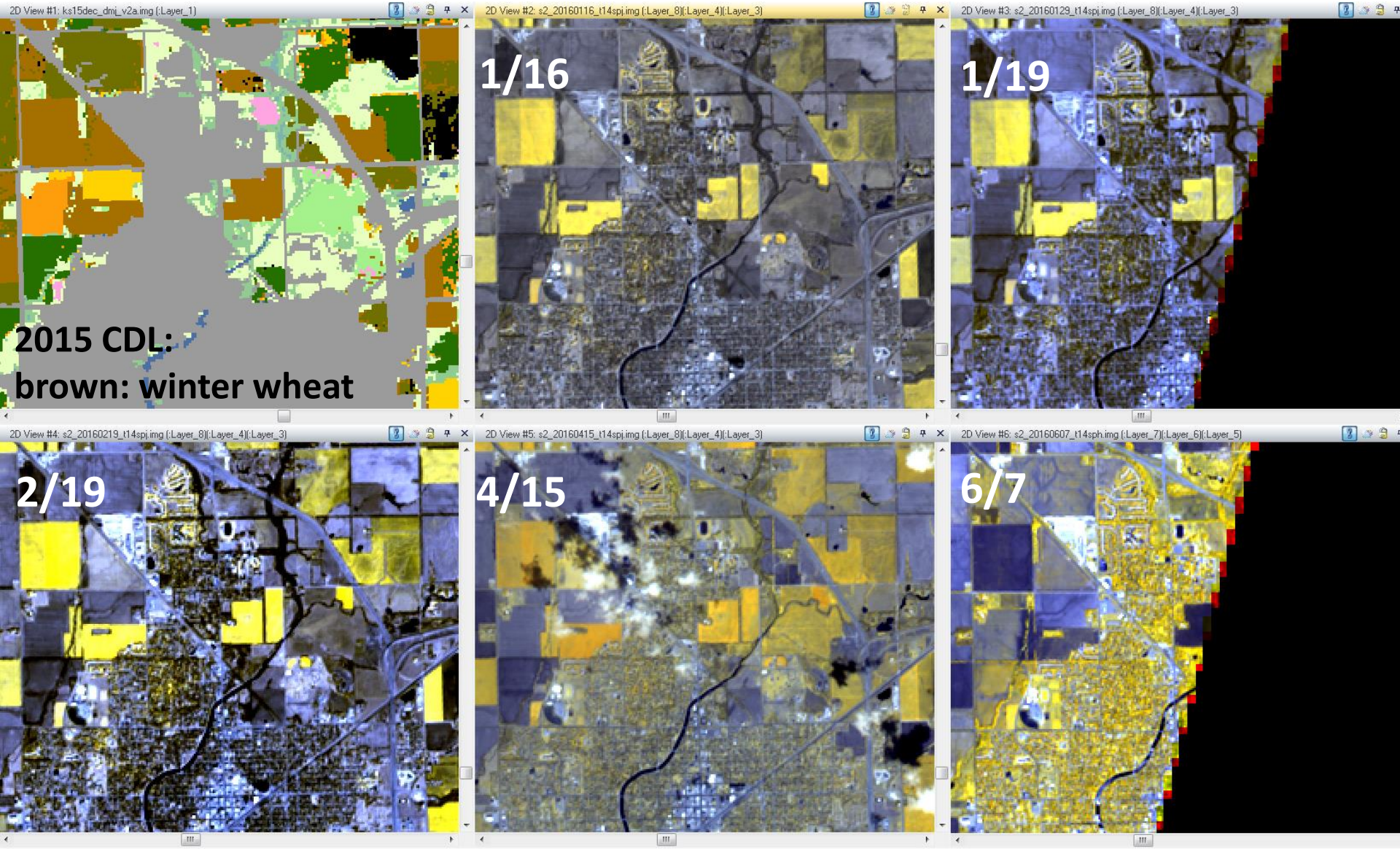
Site 2: Sentinel-2a red edge bands

(20 m, red=b7, green=b6, blue=b5)



Site 3: Sentinel-2a red edge bands

(20 m, red=b7, green=b6, blue=b5)



Summary

- We need more frequent collections
  - Current ~5% daily chance from Landsat is poor
    - No real chance to monitor seasonal vegetation dynamics
  - Adding Sentinel-2a and b will really help
- 10m very compelling, 15m could also be considered
  - Not all crop fields are big
  - Not all crop fields are homogenous
  - We cannot still be fixed at 30m for L10 (2027?)
- Red edge
  - Real understanding of utility is needed

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